An Overview of Acquisition Logistics

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INTRODUCTION

The systems acquisition process is a myriad of events which must be accomplished for the development, production, and deployment of a system. You may think that the acquisition process is almost exclusively an engineering function followed by the initiation of logistics support upon system deployment. Nothing could be further from the truth. When viewed from a life cycle cost (LCC) perspective, systems go through sequential cost stages. These stages are:

a. Research, Development, Test and Evaluation (RDT&E)
b. Production
c. Operation and Maintenance (O&M) (including salvage)

When looking at the costs associated with each of these stages over an extended period of time, it has been discovered that the O&M cost of cyclically operated (used over and over) systems has steadily risen to a point where they now consume nearly 60% of the systems total LCC. This figure will vary when analyzing individual systems, but represents a real concern when viewed as an average across all systems.

Further impacting system LCC is the timing of key program decisions such as defining the operational scenario, establishing quantitative performance requirements, quantifying the number of systems to be fielded, specifying deployment locations, and selecting a maintenance concept. Studies have shown, that on the average, by the end of systems concepts studies, 70% of the decisions defining total LCC have been made; by the end of system design definition, 85%; and 95% by the end of full scale development. This doesn't mean the actual expenditure of funds, but rather, that future spending has been significantly influenced because of the decisions that were made. It must be added that once these decisions have been made, changing them at a later date could drastically affect program costs.

Knowing that on the average, the greatest amount of total LCC dollars are spent on O&M, which really equates to logistics support, and that the vast percentage of total LCC is decided early in the acquisition process, it becomes apparent that logistics planning must begin at the front end of an acquisition program.

ACQUISITION LOGISTICS

Acquisition Logistics is a multi-functional, technical management discipline associated with the design, development, test, production, fielding, sustainment, and improvement/modification of cost-effective systems that achieve the user's peacetime and wartime readiness requirements. The principal objectives of Acquisition Logistics are to ensure that support considerations are an integral part of the system's design requirements, that the system can be cost-effectively supported throughout its life-cycle, and that the infrastructure elements necessary for the initial fielding and operational support of the system are identified, developed and acquired. The majority of a system's life-cycle costs can be attributed directly to operations and support costs once the system is fielded. Because these costs are largely determined early in the system development period, it is vitally important that system developers evaluate the potential operational and support costs of alternative designs and factor these into early design decisions.

Acquisition Logistics activities are most effective when they are integral to both the contractor's and Government's systems engineering technical and management processes. When this is the case, system designers, acquisition logisticians, and program managers are best able to identify and tradeoff support considerations with other system cost, schedule, and performance parameters to arrive at an optimum balance of system requirements that meet the user's operational and readiness requirements.

Acquisition logistics can best be described as a process of systematically identifying and assessing logistics alternatives, analyzing and resolving logistics deficiencies, and managing logistics throughout the system’s development and initial deployment cycles. Acquisition logistics then is the front-end activities of the logistics life of a system, while sustainment logistics would be those activities performed during the operational life of the system to allow it to perform its mission. Should systems be subject to modifications after deployment, the acquisition logistics processes would once again be activated during that portion of the development, production and initial deployment. A generally accepted description of logistics states that it is a disciplined, unified and iterative approach to the management and technical activities necessary to:

a. Develop support requirements that are related consistently to readiness objectives.
b. Integrating support considerations into the system and equipment design.
c. Identify the most cost-effective approach to supporting the system when it is fielded.
d. Ensure the required support structure elements are developed, acquired and delivered.

What exactly do these statements mean? First, it stipulates that the logistics processes must be diligently applied (disciplined). No two acquisition programs are alike and likewise, no two logistics programs in support of an acquisition will be alike. However, <u>all</u> logistics support elements must be evaluated for program applicability. When it has been determined what specific support resources are needed, they must be pursued methodically. Also, inherent in this description is the uncompromising need for the logistics processes to be performed and managed as a single entity (unified). The interrelationship of the support elements to each other is such that a change in one could greatly alter requirements in another. The impact could be in cost, schedule, performance, or design. Even the very need for an element may become questionable. In order for the logistics program to be effective, it must be periodically and systematically reviewed and updated as the program progresses (iterative). Acquisition programs are extremely dynamic. Numerous factors. both in and out of program office control, change the way a program advances through the acquisition cycle. From the results of internal trade-off studies, to higher authority intervention, to changes in requirements from the using command, all can be equally valid and necessary but can also be equally devastating to the timely development of the logistics support structure for a system. All changes must be evaluated for their impact on the support elements and the other logistics processes involved. From this, plans must be revised to incorporate the change with minimal disruption and expense to the program and to the systems future logistics support.

As systems are being developed, emphasis must be placed on designing-in, to the maximum extent feasible, those capabilities that improve and enhance logistics support. A paramount concern must be to obtain the right combination of logistics elements that will maximize system readiness at minimum life cycle cost. It is not only necessary that each logistics element be optimized to the system it will support, but also optimized to each other.

Acquisition logistics efforts should be established as a part of both the Government's and contractor's systems engineering process and managed in a unified, disciplined, and iterative manner using an IPPD/IPT approach. System supportability objectives should be developed early in the system development cycle through a disciplined analysis of the intended use of the system and the user's peacetime and wartime readiness requirements.

As system design progresses, deciding how the logistics support system must function, and its composition, is only part of the challenge. In most programs, industry plays a, if not the, major role in system planning, design, and fielding. It is incumbent upon the program logisticians to translate logistics requirements into contractual requirements, and then, more importantly, to ensure the requirements are met. One must not lose sight of the fact, however, that a significant portion of the logistics resource needed to support a system may come from existing inventories. Therefore, equal attention and coordination must be given to the identification and acquisition of these resources through government agencies.

After a system is fielded, the logistics support structure devised for it is put to the true test. It would be unrealistic to expect every facet of the logistics infrastructure for a system to perform as planned. With this as an accepted given, follow on actions must be pursued to correct deficiencies. A system will inevitably be modified during its life cycle. Modifications, too, require logistics planning just as a new acquisition. Logistics planning does not end until a system is retired from the inventory. So the process of planning and implementing logistics support will continually evolve.

TYPICAL ELEMENTS OF LOGISTICS SUPPORT

Logistics support elements subdivide the logistics program into manageable functional areas and disciplines. You must realize that it doesn’t matter whether the program is a large one, like a new Intercontinental Ballistic Missile (ICBM), or a small one, like a new helmet for pilots, all logistics elements must be evaluated for applicability. For all practical purposes, what changes between large and small programs is the depth of effort to be performed in each element, even though both programs may include the same elements in their support planning. There is no universal agreement concerning what formally comprises the logistics support elements. The element descriptions to follow represent those generally accepted in the Department of Defense.

1. ***Maintenance Planning***: This process establishes maintenance concepts and requirements for the life of the system. It includes, but is not limited to, levels of repair, repair times, testability requirements, support equipment needs, manpower skills, facilities, interservice, organic and contractor mix of repair responsibility, site activation, etc. This element has a great impact on the planning, development, and acquisition of other logistics support elements. As you read the descriptions of the remaining support elements you should ask, "How would this logistics element

be affected by the maintenance concept for the system?". You will soon realize the impact in nearly all cases is monumental. It goes without saying that the future holds interesting challenges for maintenance planners. Even now systems and operational concepts are being planned that require innovative maintenance approaches such aircraft and ships using stealth technology, greater emphasis on joint operations (Future Vision 2010), and orbiting manned space stations. The conventional maintenance concepts must, by necessity, give way to new dimensions of support.

2. ***Manpower and Personnel***: This element involves the identification and acquisition of personnel (military & civilian) with the skills and grades required to operate, maintain, and support systems over their lifetime. Early identification is essential. If the needed manpower is an additive requirement to existing manpower levels of an organization, a formalized process of identification and justification must be made to higher authority. Add to this, the necessity to train these persons, new and existing, in their respective functions on the new system, and the seriousness of any delays in the accomplishment of this element become apparent. In the case of military requirements, manpower needs can, and in many cases do, ripple all the way back to recruiting quotas.

3. ***Supply Support***: This element consists of all management actions, procedures, and techniques necessary to determine requirement to acquire, catalog, receive, store, transfer, issue and dispose of spares, repair parts, and supplies. In layman terms, this means having the right spares, repair parts, and supplies available, in the right quantities, at the right place, at the right time, at the right price. The process includes provisioning for initial support, as well as acquiring, distributing, and replenishing inventories. Keep in mind, an aircraft can be grounded just as quickly for not having the oil to put in the engine as it can for not having the engine.

4. ***Support Equipment (SE)***: This element is made up of all equipment (mobile or fixed) required to support the operation and maintenance of a system. This includes ground handling and maintenance equipment, tools, metrology and calibration equipment, and manual and automatic test equipment. During the acquisition of systems, program managers are expected to decrease the proliferation of support equipment into the inventory by minimizing the development of new support equipment and giving more attention to the use of existing government or commercial equipment. Most programs are a mix of common and peculiar (commercial and new design) SE. Equal emphasis must be placed on the identification, funding and acquisition of both. A program office may be making a serious mistake if they think the SE that is currently in the inventory will be available when needed. It may take longer to get some of the existing inventory items, than it would for new design items provided by the contractor. The availability of the prime system can be heavily influenced by the SE used for fault detection/isolation and repair. Most SE items are repairable assets as well and, therefore, requires the timely development and fielding of a their own logistics support system. This means that SE also needs maintenance plans, technical orders, spares, facilities, trained manpower, support equipment, etc. It should be obvious that if the support equipment isn't available because it cannot be repaired, the availability of the prime mission item could be affected.

5. ***Technical Data***: This element represents recorded information regardless of form or character (such as manuals and drawings) of scientific or technical nature. Computer programs and related software are not technical data; documentation of computer programs and related software

is. Technical manuals and engineering drawings are the most expensive and probably the most important data acquisitions made in support of a system. It is the technical manuals that provide the instructions for operation and maintenance of a system. Without them it may be difficult, if not impossible, to operate and/or maintain the prime system or its support equipment and training devices. Also crucial to a systems LCC is engineering drawings. They allow competitive reprocurement of spare and repair parts and the modification of systems which, in the long run, should minimize the systems LCC.

6. ***Training and Training Support***: This element consists of the processes, procedures, techniques, training devices, and equipment used to train civilian and military personnel to operate and support a system. This includes individual and crew training, new equipment training, initial, formal, and on-the-job training. Though the greatest amount of training is accomplished just prior to the fielding of a system, it must be remembered that in most programs, a large number of individuals must also be trained to support the system test program. This can occur several years before system deployment. It's common practice for trainers/training devices to be designed and produced to support a recurring training program. Since a trainer is an end item in itself, it too requires the establishment of a logistics support structure, as was done for support equipment and the primary end item. The training of operating and maintenance personnel can be seriously impeded if trainers are not usable because technical orders, spares, support equipment, facilities, trained operators, etc., are not available. The less than optimum training of system operators and maintainers could degrade mission effectiveness and decrease system availability.

7. ***Computer Resources Support***: This element encompasses the facilities, hardware, software, documentation, manpower, and personnel needed to operate and support mission critical computer hardware/software systems. As both the primary end item, support equipment, and training devices increase in complexity, more and more software is being used. The expense associated with the design and maintenance of software programs is so high that one cannot afford to not manage this process effectively. It is standard practice to establish some form of computer resource working group to accomplish the necessary planning and management of computer resources support. As can be seen in its definition, this element does cross the lines of responsibility in other support elements (i.e., facilities, manpower, etc.). It becomes a program office decision whether all the resource requirements needed to support this element are managed by a single CRS manager or by the other appropriate logistics element managers with the CRS manager monitoring.

8. ***Facilities***: This element consists of the permanent and semi-permanent real property assets required to support a system, including studies to define types of facilities or facility improvements, location, space needs, environmental requirements, and equipment. Certainly the nonavailability of facilities can be just as damaging to a system as would be the lack of spare parts, trained personnel, or support equipment. A last minute decision to deploy a system to a different locale may require extraordinary efforts to correct facility delays. Keep in mind, facility requirements can range from the simple addition of electrical power to an existing work area, to the design and construction of a multi-million dollar project. In either case, the absence of the necessary capabilities within a facility, or the absence of the facility itself, will adversely affect the prime system the facility is intended to support.

9. ***Packaging, Handling, Storage, and Transportation (P,H,S,&T)***: This element is the combination of resources, processes, procedures, design, considerations, and methods to ensure that all system, equipment, and support items are preserved, packaged, handled, and transported properly, including environmental considerations, equipment preservation for the short and long storage, and transportability. Packaging is more than cardboard boxes and styrofoam peanuts. Some items require special environmentally controlled, shock isolated containers for transport to and from a repair facility. A single package like this can cost tens of thousands of dollars. It also comes as no surprise that these types of reusable, repairable containers would also need spare parts, technical data, support equipment, etc., for their own support. P,H,S,&T may be a somewhat overlooked element, but it's not inexpensive. The reliability of a component can be significantly influenced by how it is packaged, what type of handling equipment and procedures are used, where and how it is stored, and the mode of transportation used to get it from the vendor to the eventual user.

10. ***Design Interface***: This is the relationship of logistics-related design parameters to readiness and support resource requirements. Logistics-related design parameters include:

a. reliability and maintainability (R&M)
b. human factors
c. system safety
d. survivability and vulnerability
e. hazardous material management
f. standardization and interoperability
g. energy management
h. corrosion
i. nondestructive inspection
j. transportability

These logistics-related design parameters are expressed in operational terms rather than inherent values and specifically relate to system readiness objectives and support costs of the system. Design interface really boils down to evaluating all facets of an acquisition from design to support and operational concepts for logistical impacts to the system itself and the logistic infrastructure.

MANAGEMENT OF ACQUISITION LOGISTICS

The explanation provided above has only been a thumbnail sketch of the support process. Each of the logistics support elements have their own set of process, procedures and techniques. However, one must not forget that a major key to success in an acquisition logistics program is "Integration". No program, and more specifically, no logistics element manager, can afford to be so myopic in the management of their individual element that they lose sight of the extensive interrelationship of the elements to each other. The administration of any of the logistics elements is a two-fold process; the individualized management of that element and the optimization of the elements to each other.

It is common practice across DOD to have total responsibility for a systems acquisition levied on a single program manager. It is also a common practice for the program manager to delegate most, if not all, the responsibility for establishing the logistics support system to a logistics manager. This person usually has a moderate to intensive background in acquisition logistics and, depending upon the size of the acquisition program, will have other logisticians perform the tasks necessary to identify, plan and implement the logistics support system.

One point, mentioned earlier must be made again. Logisticians should make every effort to influence the design of the system for supportability, then concentrate on optimizing the balance of logistics support elements to the prime system and to each other.

SUMMARY

The concepts, processes and procedures of acquisition logistics are certainly no panacea for all the ills associated with the acquisition and support of new or modified systems. The precepts of logistics support planning and management do provide a process which can more thoroughly examine the requirements for supporting equipment vital to our defense needs. This thorough, systematic approach to logistics support is mandatory in the prevailing climate of cost-effectiveness. The optimum balance between performance and life cycle cost can only be achieved by including logistics support considerations in all phases of the system's life cycle.